AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Cancelled)

2. (Cancelled)

3. (Cancelled)

4. (Currently Amended) A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals;~~A wireless communication system according to claim 3,~~

wherein said means for performing nulling uses a complex conjugate transposed matrix of a Q matrix produced by QR-decomposing the channel matrix as nulling.

5. (Currently Amended) ~~A wireless communication system according to claim 3,~~ A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a

receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals;

wherein said transmitted signals are demodulated in a descending order from a transmitted sequence transmitted from an Mth transmitted antenna to a transmitted sequence transmitted from a first transmitted antenna, based on the nulled signals.

6. (Currently Amended) ~~A wireless communication system according to claim 3,~~ A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals;

~~wherein said receiving apparatus comprises:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix.

7. (Currently Amended) ~~A wireless communication system according to claim 3~~ A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals;~~,~~

~~wherein said receiving apparatus comprises:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting and outputting a symbol candidate for said converted signal based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said symbol candidate, and said R matrix.

8. (Currently Amended) ~~A wireless communication system according to claim 3~~ A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals,

~~wherein said receiving apparatus comprises:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

9. (Currently Amended) ~~A wireless communication system according to claim 3~~ A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals,

~~wherein said receiving apparatus comprises:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates.

10. (Currently Amended) ~~A wireless communication system according to claim 3~~ A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals,

~~wherein said receiving apparatus comprises:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting a symbol candidate for a demodulated sequence based on said received signals, and outputting a transmitted symbol candidate;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted symbol candidate; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

11. (Currently Amended) ~~A wireless communication system according to claim 3~~ A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals,

~~wherein said receiving apparatus comprises:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted

sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

12. (Currently Amended) ~~A wireless communication system according to claim 3~~ A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals,

~~wherein said receiving apparatus comprises:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) demodulated signals based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, said transmitted sequence candidates, and said symbol candidates.

13. (Currently Amended) ~~A wireless communication system according to claim 3~~ A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

means for performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for outputting a likelihood for bits of said transmitted signals based on the nulled signals,

~~wherein said receiving apparatus comprises:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) converted signals based on said received signals;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said symbol candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said

transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

14. (Previously Presented) A wireless communication system according to claim 6, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Lp-1 (Lp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Lp (Lp is an integer of 1 or greater) maximum likelihoods and Lp transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

15. (Previously Presented) A wireless communication system according to claim 6, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Kp-1 (Kp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Kp+1 maximum likelihoods and Kp+1 transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

16. (Previously Presented) A wireless communication system according to claim 6, wherein said transmitted sequence estimator comprises likelihood calculator groups in M stages (M is an integer of 2 or greater) and signal selector groups in the M stages.

17. (Currently Amended) A wireless communication system according to claim 6, wherein said transmitted sequence estimator comprises likelihood calculator groups in N stages (N is an integer of 2 or greater) and signal selector groups in ~~the~~ M stages.

18. (Previously Presented) A wireless communication system according to claim 6, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects and outputs a most likely transmitted sequence.

19. (Previously Presented) A wireless communication system according to claim 6, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and

a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for said sequence.

20. (Previously Presented) A wireless communication system according to claim 6, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for a bit sequence transmitted by said sequence.

21. (Previously Presented) A wireless communication system according to claim 6, wherein said transmitted sequence estimator includes a likelihood calculator for generating a converted signal replica using elements of said R matrix and calculating the likelihood using a physical quantity measured from said converted signal replica and said received signals.

22. (Original) A wireless communication system according to claim 21, wherein said likelihood calculator calculates the likelihood using a squared Euclidean distance between said received signals and said converted signal replica.

23. (Original) A wireless communication system according to claim 21, wherein said likelihood calculator calculates the likelihood using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance between said received signals and said converted signal replica.

24. (Previously Presented) A wireless communication system according to claim 7, wherein said transmitted symbol candidate selector employs a linear filter.

25. (Previously Presented) A wireless communication system according to claim 7, wherein said transmitted symbol candidate selector employs maximum likelihood estimation.

26. (Previously Presented) A wireless communication system according to claim 8, wherein said priority determiner employs received electric power of each of said transmitted sequences.

27. (Previously Presented) A wireless communication system according to claim 8, wherein said priority determiner employs a received electric power vs. noise electric power ratio of each of said transmitted sequences.

28. (Previously Presented) A wireless communication system according to claim 8, wherein said priority determiner employs a received electric power vs. noise electric power ratio and an interference electric power ratio of each of said transmitted sequences.

29. (Previously Presented) A wireless communication system according to claim 9, wherein said transmitted sequence candidate selector employs a linear filter.

30. (Previously Presented) A wireless communication system according to claim 9, wherein said transmitted sequence candidate selector employs maximum likelihood estimation.

31. (Previously Presented) A wireless communication system according to claim 8, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said priority determiner determines said priorities based on said modulating processes for the respective transmission antennas.

32. (Original) A wireless communication system according to claim 31, wherein a priority is given to an antenna which has sequences of a lower modulation multi-valued number among said transmission antennas.

33. (Previously Presented) A wireless communication system according to claim 14, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said signal selector determines the number of error signals and transmitted symbol candidates which are output depending on the modulating process for the transmission antenna to be processed by a likelihood calculator in a next stage.

34. (Previously Presented) A wireless communication system according to claim 6, wherein said transmitted sequence estimator includes a likelihood calculator for calculating the likelihood using the difference between a squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a squared Euclidean distance between a converted signal replica at a bit 1 and the received signals.

35. (Original) A wireless communication system according to claim 34, wherein said transmitted sequence estimator includes an accumulator for accumulating a first squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a second squared Euclidean distance between a converted signal replica at a bit 1 and the received signals, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

wherein said likelihood calculator calculates the likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

36. (Previously Presented) A wireless communication system according to claim 34, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

37. (Previously Presented) A wireless communication system according to claim 8, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective independent coding ratios, and said priority determiner determines said priorities based on the coding ratios for the respective transmission antennas.

38. (Previously Presented) A wireless communication system according to claim 6, wherein said channel coefficient estimator estimates, in the transmitting apparatus having the M

(M is an integer of 2 or greater) transmission antennas, the channel coefficients using pilot symbols periodically transmitted according to a symbol pattern inherent in each of the transmission antennas and known to the receiving apparatus.

39. (Previously Presented) A wireless communication system according to claim 6, wherein said transmitting apparatus spreads in advance and then transmits the transmitted signals, and said QH processor multiplies the received signal vector having said received signals after being despread as elements by the complex conjugate transposed matrix of said Q matrix and outputs the product as the converted signal.

40. (Cancelled)

41. (Original) A wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, with a receiving apparatus having N (N is an integer of 2 or greater), said receiving apparatus comprising:

an accumulator for accumulating a first squared Euclidean distance at a bit 0 and a second squared Euclidean distance at a bit 1, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

means for calculating a likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

42. (Original) A wireless communication system according to claim 41, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

43. (Cancelled)

44. (Cancelled)

45. (Cancelled)

46. (Currently Amended) ~~A receiving apparatus according to claim 43~~ A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

means for demodulating said transmitted signals based on the nulled signals,

wherein said means for performing nulling uses a complex conjugate transposed matrix of a Q matrix produced by QR-decomposing the channel matrix as nulling.

47. (Currently Amended) ~~A receiving apparatus according to claim 43~~ A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

means for demodulating said transmitted signals based on the nulled signals,

wherein said transmitted signals are demodulated in a descending order from a transmitted sequence transmitted from an Mth transmitted antenna to a transmitted sequence transmitted from a first transmitted antenna, based on the nulled signals.

48. (Currently Amended) ~~A receiving apparatus according to claim 43~~ A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for demodulating said transmitted signals based on the nulled signals, ~~comprising:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix.

49. (Currently Amended) ~~A receiving apparatus according to claim 43~~ A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for demodulating said transmitted signals based on the nulled signals, ~~comprising:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting and outputting a symbol candidate for said converted signal based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said symbol candidate, and said R matrix.

50. (Currently Amended) ~~A receiving apparatus according to claim 43~~ A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for demodulating said transmitted signals based on the nulled signals, ~~comprising:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

51. (Currently Amended) ~~A receiving apparatus according to claim 43~~ A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless

communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for demodulating said transmitted signals based on the nulled signals, ~~comprising:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates.

52. (Currently Amended) ~~A receiving apparatus according to claim 43~~ A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for demodulating said transmitted signals based on the nulled signals, ~~comprising:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting a symbol candidate for a demodulated sequence based on said received signals, and outputting a transmitted symbol candidate;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted symbol candidate; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

53. (Currently Amended) ~~A receiving apparatus according to claim 43~~ A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for demodulating said transmitted signals based on the nulled signals, ~~comprising:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said

transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

54. (Currently Amended) ~~A receiving apparatus according to claim 43~~ A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for demodulating said transmitted signals based on the nulled signals, ~~comprising:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) demodulated signals based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, said transmitted sequence candidates, and said symbol candidates.

55. (Currently Amended) ~~A receiving apparatus according to claim 43~~ A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

means for performing nulling representative of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas;

means for demodulating said transmitted signals based on the nulled signals, ~~comprising:~~

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) converted signals based on said received signals;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said symbol candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

56. (Previously Presented) A receiving apparatus according to claim 48, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Lp-1 (Lp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Lp (Lp is an integer of 1 or greater) maximum likelihoods and Lp transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

57. (Previously Presented) A receiving apparatus according to claim, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Kp-1 (Kp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Kp+1 maximum likelihoods and Kp+1 transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

58. (Previously Presented) A receiving apparatus according to claim 48, wherein said transmitted sequence estimator comprises likelihood calculator groups in M stages (M is an integer of 2 or greater) and signal selector groups in the M stages.

59. (Previously Presented) A receiving apparatus according to claim 48, wherein said transmitted sequence estimator comprises likelihood calculator groups in N stages (N is an integer of 2 or greater) and signal selector groups in the M stages.

60. (Previously Presented) A receiving apparatus according to claim 48, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects and outputs a most likely transmitted sequence.

61. (Previously Presented) A receiving apparatus according to claim 48, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for said sequence.

62. (Previously Presented) A receiving apparatus according to claim 48, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal

selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for a bit sequence transmitted by said sequence.

63. (Previously Presented) A receiving apparatus according to claim 48, wherein said transmitted sequence estimator includes a likelihood calculator for generating a converted signal replica using elements of said R matrix and calculating the likelihood using a physical quantity measured from said converted signal replica and said received signals.

64. (Original) A receiving apparatus according to claim 63, wherein said likelihood calculator calculates the likelihood using a squared Euclidean distance between said received signals and said converted signal replica.

65. (Original) A receiving apparatus according to claim 63, wherein said likelihood calculator calculates the likelihood using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance between said received signals and said converted signal replica.

66. (Previously Presented) A receiving apparatus according to claim 49, wherein said transmitted symbol candidate selector employs a linear filter.

67. (Previously Presented) A receiving apparatus according to claim 49, wherein said transmitted symbol candidate selector employs maximum likelihood estimation.

68. (Previously Presented) A receiving apparatus according to claim 50, wherein said priority determiner employs received electric power of each of said transmitted sequences.

69. (Previously Presented) A receiving apparatus according to claim 50, wherein said priority determiner employs a received electric power vs. noise electric power ratio of each of said transmitted sequences.

70. (Previously Presented) A receiving apparatus according to claim 50, wherein said priority determiner employs a received electric power vs. noise electric power ratio and an interference electric power ratio of each of said transmitted sequences.

71. (Previously Presented) A receiving apparatus according to claim 51, wherein said transmitted sequence candidate selector employs a linear filter.

72. (Previously Presented) A receiving apparatus according to claim 51, wherein said transmitted sequence candidate selector employs maximum likelihood estimation.

73. (Previously Presented) A receiving apparatus according to claim 50, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said priority determiner determines said priorities based on said modulating processes for the respective transmission antennas.

74. (Original) A receiving apparatus according to claim 73, wherein a priority is given to an antenna which has sequences of a lower modulation multi-valued number among said transmission antennas.

75. (Previously Presented) A receiving apparatus according to claim 56, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said signal selector determines the number of error signals and transmitted symbol candidates which are output depending on the modulating process for the transmission antenna to be processed by a likelihood calculator in a next stage.

76. (Previously Presented) A receiving apparatus according to claim 48, wherein said transmitted sequence estimator includes a likelihood calculator for calculating the likelihood using the difference between a squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a squared Euclidean distance between a converted signal replica at a bit 1 and the received signals.

77. (Original) A receiving apparatus according to claim 76, wherein said transmitted sequence estimator includes an accumulator for accumulating a first squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a second squared Euclidean distance between a converted signal replica at a bit 1 and the received signals, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

wherein said likelihood calculator calculates the likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

78. (Previously Presented) A receiving apparatus according to claim 76, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

79. (Previously Presented) A receiving apparatus according to claim 46, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective independent coding ratios, and said priority determiner determines said priorities based on the coding ratios for the respective transmission antennas.

80. (Previously Presented) A receiving apparatus according to claim 48, wherein said channel coefficient estimator estimates, in the transmitting apparatus having the M (M is an integer of 2 or greater) transmission antennas, the channel coefficients using pilot symbols periodically transmitted according to a symbol pattern inherent in each of the transmission antennas and known to the receiving apparatus.

81. (Previously Presented) A receiving apparatus according to claim 48, wherein said transmitting apparatus spreads in advance and then transmits the transmitted signals, and said QH processor multiplies the received signal vector having said received signals after being

despread as elements by the complex conjugate transposed matrix of said Q matrix and outputs the product as the converted signal.

82. (Cancelled)

83. (Original) A receiving apparatus having N (N is an integer of 2 or greater) reception antennas in a wireless communication system for receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, said receiving apparatus comprising:

an accumulator for accumulating a first squared Euclidean distance at a bit 0 and a second squared Euclidean distance at a bit 1, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

means for calculating a likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

84. (Original) A recording apparatus according to claim 83, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

85. (Cancelled)

86. (Cancelled)

87. (Cancelled)

88. (Currently Amended) ~~A demodulating method according to claim 85~~A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

demodulating said transmitted signals based on the nulled signals;~~,~~

wherein said step of performing nulling uses a complex conjugate transposed matrix of a Q matrix produced by QR-decomposing the channel matrix as nulling.

89. (Currently Amended) ~~A demodulating method according to claim 85~~ A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

demodulating said transmitted signals based on the nulled signals;

wherein said transmitted signals are demodulated in a descending order from a transmitted sequence transmitted from an Mth transmitted antenna to a transmitted sequence transmitted from a first transmitted antenna, based on the nulled signals.

90. (Currently Amended) ~~A demodulating method according to claim 85,~~ A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

demodulating said transmitted signals based on the nulled signals;

wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix.

91. (Currently Amended) ~~A demodulating method according to claim 85,~~ A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

demodulating said transmitted signals based on the nulled signals;

wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting and outputting a symbol candidate for said converted signal based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said symbol candidate, and said R matrix.

92. (Currently Amended) ~~A demodulating method according to claim 85,~~ A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

demodulating said transmitted signals based on the nulled signals;

wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal and said R matrix; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

93. (Currently Amended) ~~A demodulating method according to claim 85,~~ A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

demodulating said transmitted signals based on the nulled signals;

wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates.

94. (Currently Amended) ~~A demodulating method according to claim 85,~~ A demodulating method of receiving and demodulating transmitted signals from a transmitting

apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

demodulating said transmitted signals based on the nulled signals;

wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted symbol candidate selector for selecting a symbol candidate for a demodulated sequence based on said received signals, and outputting a transmitted symbol candidate;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted symbol candidate; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

95. (Currently Amended) ~~A demodulating method according to claim 85,~~ A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

demodulating said transmitted signals based on the nulled signals;

wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said transmitted sequence candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said

transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

96. (Currently Amended) ~~A demodulating method according to claim 85,~~ A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

demodulating said transmitted signals based on the nulled signals;

wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a QR decomposer for performing QR decomposition on the channel matrix of said channel coefficients and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) demodulated signals based on said received signals; and

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, said transmitted sequence candidates, and said symbol candidates.

97. (Currently Amended) ~~A demodulating method according to claim 85,~~ A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

performing nulling representative of orthogonalization of the received signals, using a channel matrix having as elements channel coefficients between said reception antennas and said transmission antennas; and

demodulating said transmitted signals based on the nulled signals;

wherein said receiving apparatus comprises:

a channel coefficient estimator for estimating and outputting said channel coefficients between said between said reception antennas and said transmission antennas based on said received signals;

a priority determiner for determining priorities between transmission sequences transmitted from said transmission antennas based on said received signals;

a sorter for sorting said channel coefficients based on the channel coefficients estimated by said channel coefficient estimator and the priorities determined by said priority determiner, and outputting a modified channel matrix;

a QR decomposer for performing QR decomposition on said modified channel matrix and outputting a Q matrix and an R matrix;

a QH processor for multiplying a received signal vector having said received signals as elements by a complex conjugate transposed matrix of said Q matrix and outputting the product as a converted signal;

a transmitted sequence candidate selector for determining candidate sequences for L (L is an integer ranging from 1 to M) converted signals based on said received signals and outputting the determined candidate sequences as transmitted sequence candidates;

a transmitted symbol candidate selector for selecting and outputting symbol candidates for (M-L) converted signals based on said received signals;

a transmitted sequence estimator for outputting at least one of a transmitted sequence, a likelihood for said transmitted sequence, and a likelihood for bits transmitted by said transmitted sequence, based on said converted signal, said R matrix, and said symbol candidates; and

a restorer for restoring and outputting at least one of said transmitted sequence, the likelihood for said transmitted sequence, and the likelihood for bits transmitted by said transmitted sequence, based on the output from said transmitted sequence estimator and said priorities.

98. (Previously Presented) A demodulating method according to claim 90, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Lp-1 (Lp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Lp (Lp is an integer of 1 or greater) maximum likelihoods and Lp transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

99. (Previously Presented) A demodulating method according to claim 90, wherein said transmitted sequence estimator includes likelihood calculator groups and signal selectors in P stages (P is an integer of 1 or greater);

a likelihood calculator group in a pth (p is an integer ranging from 1 to P) stage comprising Kp (Kp is an integer of 1 or greater) likelihood calculators;

each of said likelihood calculators calculating a likelihood in the pth stage and generating said transmitted symbol candidates based on the converted signal, said R matrix, Kp-1 (Kp-1 is an integer of 1 or greater) error signals output from a signal selector in a (p-1)th stage, and the transmitted symbol candidates; and

a signal selector in the pth stage outputting Kp+1 maximum likelihoods and Kp+1 transmitted symbol candidates which give the likelihoods, based on Kp likelihoods output from the likelihood calculator group in the pth stage and said transmitted symbol candidates.

100. (Currently Amended) A demodulating method according to claim 90, wherein said transmitted sequence estimator comprises likelihood calculator groups in M stages (M is an integer of 2 or greater) and signal selector groups in the M stages.

101. (Previously Presented) A demodulating method according to claim 90, wherein said transmitted sequence estimator comprises likelihood calculator groups in M stages (M is an integer of 2 or greater) and signal selector groups in the M stages.

102. (Previously Presented) A demodulating method according to claim 90, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects and outputs a most likely transmitted sequence.

103. (Previously Presented) A demodulating method according to claim 90, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for said sequence.

104. (Previously Presented) A demodulating method according to claim 90, wherein said transmitted sequence estimator includes signal selectors in a plurality of stages, and a signal

selector in a final stage selects a most likely transmitted sequence and outputs a likelihood for a bit sequence transmitted by said sequence.

105. (Previously Presented) A demodulating method according to claim 90, wherein said transmitted sequence estimator includes a likelihood calculator for generating a converted signal replica using elements of said R matrix and calculating the likelihood using a physical quantity measured from said converted signal replica and said received signals.

106. (Original) A demodulating method according to claim 105, wherein said likelihood calculator calculates the likelihood using a squared Euclidean distance between said received signals and said converted signal replica.

107. (Original) A demodulating method according to claim 105, wherein said likelihood calculator calculates the likelihood using a Euclidean distance converted by performing a given processing operation on a squared Euclidean distance between said received signals and said converted signal replica.

108. (Previously Presented) A demodulating method according to claim 91, wherein said transmitted symbol candidate selector employs a linear filter.

109. (Previously Presented) A demodulating method according to claim 91, wherein said transmitted symbol candidate selector employs maximum likelihood estimation.

110. (Previously Presented) A demodulating method according to claim 92, wherein said priority determiner employs received electric power of each of said transmitted sequences.

111. (Previously Presented) A demodulating method according to claim 92, wherein said priority determiner employs a received electric power vs. noise electric power ratio of each of said transmitted sequences.

112. (Previously Presented) A demodulating method according to claim 92, wherein said priority determiner employs a received electric power vs. noise electric power ratio and an interference electric power ratio of each of said transmitted sequences.

113. (Previously Presented) A demodulating method according to claim 93, wherein said transmitted sequence candidate selector employs a linear filter.

114. (Previously Presented) A demodulating method according to claim 93, wherein said transmitted sequence candidate selector employs maximum likelihood estimation.

115. (Previously Presented) A demodulating method according to claim 92, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said priority determiner determines said priorities based on said modulating processes for the respective transmission antennas.

116. (Original) A demodulating method according to claim 115, wherein a priority is given to an antenna which has sequences of a lower modulation multi-valued number among said transmission antennas.

117. (Previously Presented) A demodulating method according to claim 98, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective different numbers of signal points, and said signal selector determines the number of error signals and transmitted symbol candidates which are output depending on the modulating process for the transmission antenna to be processed by a likelihood calculator in a next stage.

118. (Previously Presented) A demodulating method according to claim 90, wherein said transmitted sequence estimator includes a likelihood calculator for calculating the likelihood using the difference between a squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a squared Euclidean distance between a converted signal replica at a bit 1 and the received signals.

119. (Original) A demodulating method according to claim 118, wherein said transmitted sequence estimator includes an accumulator for accumulating a first squared Euclidean distance between a converted signal replica at a bit 0 and the received signals and a second squared Euclidean distance between a converted signal replica at a bit 1 and the received signals, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

120. (Previously Presented) A demodulating method according to claim 118, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

121. (Previously Presented) A demodulating method according to claim 92, wherein data sequences transmitted from M transmission antennas are modulated respectively by independent modulating processes, and said modulating processes have respective independent coding ratios, and said priority determiner determines said priorities based on the coding ratios for the respective transmission antennas.

122. (Previously Presented) A demodulating method according to claim 90, wherein said channel coefficient estimator estimates, in the transmitting apparatus having the M (M is an integer of 2 or greater) transmission antennas, the channel coefficients using pilot symbols periodically transmitted according to a symbol pattern inherent in each of the transmission antennas and known to the receiving apparatus.

123. (Previously Presented) A demodulating method according to claim 90, wherein said transmitting apparatus spreads in advance and then transmits the transmitted signals, and said QH processor multiplies the received signal vector having said received signals after being despread as elements by the complex conjugate transposed matrix of said Q matrix and outputs the product as the converted signal.

124. (Cancelled)

125. (Original) A demodulating method of receiving and demodulating transmitted signals from a transmitting apparatus having M (M is an integer of 2 or greater) transmission antennas, in a receiving apparatus having N (N is an integer of 2 or greater) reception antennas, said demodulating method comprising the steps of:

accumulating a first squared Euclidean distance at a bit 0 and a second squared Euclidean distance at a bit 1, and outputting a provisional squared Euclidean distance based on the accumulated squared Euclidean distances; and

calculating a likelihood using said provisional squared Euclidean distance if either one of said first and second squared Euclidean distances is not output.

126. (Original) A demodulating method according to claim 125, wherein said squared Euclidean distance is replaced with a Euclidean distance which is converted by performing a given functional operation on said squared Euclidean distance.

127. (Cancelled)

128. (Cancelled)

129. (Cancelled)